***Which pedagogical practices and methods best support learning digital competences?***

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Studies about pedagogical practices and methods do not necessarily directly use the term “digital competence” but discuss, for example, “digital literacy”, “information seeking skills” or “ICT skills”; partly because there is not yet any established way to use the concept, and partly because it is easier to do empirical research on some narrower skill that can be defined more accurately. “Pedagogical practices and methods” are here interpreted to mean various types of activities and practices according to which learners are directed to act by the teacher in a pedagogical setting that has been the object of study. Some articles include results of learning activities from informal learning settings, in which there is not any systematical pedagogical effort included in organizing the participants’ activities.

It appears that the teaching of digital competence has not been the main object of study in recent research. Rather, the development of digital competence or related skills is often mentioned as a side-effect of using digital technology in an educational setting that focuses on other learning outcomes, such as inquiry skills or domain knowledge.

***Digital competence develops in problem-oriented, technology-rich and long-term settings***

In recent studies, pedagogical methods supporting digital competence was not directly investigated through empirical study settings, or the methods used were very descriptive, explorative or narrative. The reason for that probably is the complex and gradually developing nature of such competences, which makes them difficult to investigate trough controlled experimental methods. Some studies focused on investigating methods of using information and communication technology (ICT) in education generally or in teaching some subject domain content, and referred to digital competence or related concept as one element in that more overarching activity. Some studies examined teachers’ opinions through surveys or students’ self-reflections about the good ways to support the development of digital competence or related skills. Some articles provided policy-related suggestions for supporting students’ digital competence, without presenting explicit evidence-based results.

Many researchers appear to share the opinion that the pedagogical settings and methods supporting the development of digital competence include rich and integrated use of various technical tools, and wide range of activities that are based on complex and challenging tasks, including, for instance, students’ own knowledge creation or product construction, solving of multidisciplinary problems and collaborative activities, or project work. Similarly, the transformation of teaching practices in literacy instruction is stated to occur in classrooms where computer technologies are used throughout the day and across the curriculum. In the articles, it was emphasized that skills and competencies related to technology should not be seen narrowly, consisting only on mechanical skills of using some software application. Likewise, also the methods for learning such skills require practicing them in settings where multiple technological tools are used in an integrated way in “authentic”, complex tasks and for as real purposes as possible. Examples of such activities and tasks were rapid prototyping with realistic resources and tools; problem-solving games that give student teams complex, real-life contextualized problems, asking them to systematically use various information sources to create solutions; or digital storytelling.

One study introduced a “webquest” method for supporting information literacy skills in secondary education. The method consisted of a task where students work in groups to produce a report on a certain issue; each student specialized in one sub-topic, searching for and sharing information from the Internet about it for a joint, integrated report. The researchers concluded that the method, e.g., provided students with a possibility to work with complex topics, practice cooperative skills and face challenges of information handling and usage of ICT.

Two studies reported a research endeavour where the development of ICT skills was examined in a long-term setting where laptops were given to a group of students, and their extensive usage was implemented in the teaching practices of the group for three years. Conclusions from the studies were that rich and versatile usage of technology through laptops both in school and out school settings and in various activities, projects and school subjects developed all participants’ necessary basic digital competences. In addition, voluntary possibilities to participate in challenging ICT-related projects provided some students with ICT expertise that resembles professional expertise.

Also studies that grounded their evidence on students’ own reporting of the increase in their competences in a pedagogical intervention, describe similar conclusions about the types of practices that may support digital competencies. In a study about an international inquiry-based collaboration project in secondary school, students reported that the usage of multiple technologies in the project improved their skills on critical thinking and writing skills as well as their ICT competence. A conclusion from a survey and interview study conducted to seventh- and eighth-grade students and teachers was that the influence of technology usage on student outcomes depends more on the *quality* than *quantity* of technology use. In another study, it was emphasized that children’s game playing and experimental use of ICT does not necessarily provide them with complex, creative and productive competences or learning capabilities; complex media literacies demonstrated by the young in the investigated case were concluded to especially relate to the very problem-oriented and open-ended learning design in the setting.

***From print literacy to digital literacy***

One line of research was the examination of the ways and methods for teaching digital literacy as an alternative to traditional “print literacy”. In a meta-analysis of 20 articles about the use of digital tools (hypertext, hypermedia, Web pages etc.), it was concluded that digital learning environments and tools can impact literacy learning, but more experimental research is needed to examine technology as a component of middle-school literacy curriculum and pedagogy.

Two articles reported studies about efforts to change pedagogical practices in schools to support “multiliteracies”. One study was about implementing new literacy pedagogies with digital media in two different contexts: In an elite school and in a preparatory school for immigrant students. In the elite school, a student-led, peer-to-peer online learning initiative (a multimodal Web 2.0 Student Media Centre) was implemented. In the migrant students’ school, the researchers explored, with the school staff, various options for creating multiple pathways for the students through the use of digital learning technologies. In the other study, the researchers worked intensively for over two years with a middle school teacher designing activities to advance students’ critical multimedia literacy. The tasks included analysis and production of various kinds of texts forms: fiction books, brochures, videos, Web-pages and multimedia presentations. Noteworthy is that either of the two studies actually reported results about the successfulness of the pedagogical methods to promote multiliteracies. The main result from both studies was that it is difficult to implement new pedagogical approaches in mainstream schooling where teachers’ and students’ prevailing practices as well as institutional curriculum goals and assessment criteria are shaped by traditional print and academic literacies.

One described college course titled “Critical Literacy” provides an example of a course aiming at promoting students’ digital literacy skills. The course focussed on the practices of reading and writing with computers and the Internet. During the course, students examine the history of literacy as well as their own literate practices with print and digital texts by reading articles about the topic, having face-to-face and web-based discussions about them and writing an essay as a final product.

*Summary*

Digital competence or related skills develop in problem-oriented, technology-rich and long-term settings where technology is used in context. In such settings, various technological tools are used in integrated ways. Such settings include wide range of activities that are based on complex and challenging tasks including, for instance, students’ own knowledge creation or product construction, solving of multidisciplinary problems, collaborative activities and project work. Skills related to using technology should not be seen narrowly; therefore, also the methods for learning the skills require practicing them through complex, challenging and “authentic” activities. Concerning literacy education, the role of traditional literacy appears to be very strong in conventional school practice, which makes it difficult even to experiment with innovative methods to support print literacy or multiliteracies.